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On the Elements of the Binary Star γ Virginis, resulting from a Discussion of the Measures taken by Capt. W. H. Smyth, R.N. between the Years 1831 *and* 1850. By Mr. Hind.

"It is well known to the members of the Royal Astronomical Society, that amongst the stars observed for the *Bedford Cycle* by Captain Smyth, the interesting binary system *γ Virginis* occupied a prominent place. During the period included by the Bedford measures, a very critical and important part of the orbit was passed over, and great pains were bestowed upon the observations to render them as accurate as the nature of the object would permit. In 1831 the component stars were separated about 1″½, the smaller one being situated in the north following quadrant about 12° above the parallel of declination. From this position it was watched by Captain Smyth during its passage through the same quadrant, the central distance diminishing each year until in the early part of the year 1836 the star was pronounced *single* under the best atmospheric conditions. Before the close of the spring the Bedford telescope again afforded indications of duplicity, and two nights' observations showed that the companion had just completed a fourth part of its orbit, its position being now 12° north preceding the principal star. In 1837 a further change of no less than 83° in the same direction had taken place, the *comes* lying in the angle 265° at a distance of rather more than half a second of arc from the primary. In 1847 Captain Smyth found it still on the preceding side, but at a central distance of 2″·6, and his observations early in the year 1848, showed that it had just passed the vertical point, the measures yielding an angle of 179°·5; and at the date of the last observations in 1850, the angle had further diminished to 177°·1. It thus appears that the whole series of measures taken with the Bedford telescope include a change in the *position* of the companion-star of 260°, or nearly three-fourths of a revolution, extending, as before remarked, over a very important part of the orbit. The question, therefore, naturally suggests itself, whether an investigation of the elements from this series of measures to the *exclusion of all others*, might not be one of some value, as showing, by comparison with elements founded upon the *whole of the measures of other astronomers*, including the valuable alignments of Bradley and Pond in 1718 and 1720, what kind of dependence we may place upon elements for other binary systems computed under similar circumstances, where, during the interval between the earliest and latest observations, a portion only of the ellipse has been described, which is to be traced chiefly from the measures of one observer. In the present instance the investigation promised to lead to results of especial interest; the measures of *γ Virginis*, published in the *Bedford Cycle*, were taken by one of the most experienced observers of the present day in this particular department of astronomy, were made throughout with the same instrument, and under the most favourable conditions as regards the state of the atmosphere, the powers employed, &c. With data

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derived under these promising circumstances, an orbit fairly approximating to the true one (or to that which we have strongest reason to rely upon) might be expected as the result of their discussion; but I confess I had no idea that this series of measures (leaving untouched, as it does, the more distant part of the apparent ellipse when observations are made with comparative facility and proportionally greater accuracy), would produce a set of elements bearing such close resemblance to those of Sir John Herschel, which having been calculated upon the whole course of observations, on a method possessing peculiar recommendations, we may fairly presume to be the most exact system at present in the hands of astronomers. For the sake of immediate comparison the two orbits are subjoined together:

Elements of γ Virginis.

	I. From the Observations of Capt. W. H. Smyth.	II. Sir John Herschel's last Elements.
Perihelion Passage	1836·40	1836·39
Position at Perihelion	323° 50′	322° 12′
Ascending Node	20 34	28 42
Inclination to Plane of Projection	27 23	30 39
Angle between the Lines of Apsides and Nodes upon the Orbit	300 13	290 30
Excentricity	0·8804	0·8860
Period of Revolution	171^{yrs}·54	183^{yrs}·14

Motion in the Orbit — *retrograde.*

"In comparing these orbits, it must be borne in mind that in the present case an alteration in the position of the node of 10° has but very little influence upon the computed angles of position; and for this reason the node and the angle between the lines of nodes and apsides cannot be exactly ascertained. The agreement between the other elements is, I think, very remarkable; and as regards the period, the observations of Capt. Smyth furnish us with the time of revolution of the companion-sun round the other, differing less than *twelve* years from that which, under existing circumstances, may be regarded as the true one."

The Rev. Alfred Weld, director of the observatory at Stonyhurst College, has sent the details of his observations to determine the place of Weisse, 11^{h}, 929. The individual results are very fairly consistent.

Mean place Jan 1, 1850.

Weisse, 11, 929 R.A. $2^{h}\ 52^{m}\ 36^{s}{\cdot}38$ 6 obs. Dec. $-10^{\circ}\ 16'\ 20''{\cdot}8$ 5 obs.

In reference to Mr. John Riddle's solution of the problem for clearing the moon's distance (vol. xi. p. 63, &c.), Mr. Drach re-

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